REMARKS

Claims 1-9 and 20 are currently pending.

Claim 20 was rejected under 35 U.S.C. §101 for the reasons set forth in item No. 4 on page 2 of the Official Action, and not herein repeated. By this amendment, Applicant has amended claim 20 to comply with the statutory requirements of 35 U.S.C. §101.

Further, claims 1, 4-9 and 19 (sic 20) have been rejected under 35 U.S.C. §102(b) as anticipated by WO 96/27633 (aka U.S. Patent No. 6,127,438 -Hasegawa et al.). The arguments in support of this rejection are set forth in items No. 6 on page 3 of the Official Action, and not herein repeated.

Claims 1, 2, and 4-9 have also been rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 6,010,776 (Exsted et al.). The arguments advanced by the Examiner in support of this rejection are discussed in item No. 7 on page 4 of the Official Action, and not herein repeated.

Claims 2 and 3 have further been rejected by the Examiner under 35 U.S.C. §103(a) as obvious over Hasegawa in view of U.S. Patent No. 5,480,745 (Nishiyama et al.). The Examiner's arguments in support of their rejection are set forth in items No. 9 on page 6 of this Official Action, and not herein repeated.

Finally, claim 3 stand rejected under 35 U.S.C. §103(a) as obvious over Exsted et al. in view of U.S. Patent No. 5,176,953 (Jacoby et al.). The reasons for this rejection are discussed in items No. 10 on pages 6 and 7 of the Official Action, and not herein repeated.

Applicant respectfully traverses each of the outstanding grounds for rejection, noting that claims 2-9 and 20 depend directly or indirectly on independent claim 1. Accordingly,

if claim 1 is patentable over the relevant references (Hasegawa et al. an Exsted et al.) all claims depending from claim 1 should likewise be held patentabl.e

Claim 1 is a product by process claim which as, currently amended recites inter alia, "...treatiang the surface of the film by irradiation with ionizing radiation either before or after pore formation." Several editorial amendments have been made to claim 1; none introduces new matter. The above quoted limitation constitutes a novel feature of the present invention which imparts improved electrolyte wettability to a microporous film. Further, the step of "treating the surface of film by irradiation with ionizing radiation" (i) breaks polymer chains and forms micro cracks, thereby greatly affecting the formation and distribution of pores, which are formed during a stretching step; and (ii) removes some atoms (e.g. hydrogen) from the polymer chains existing on the surface of the film, thereby forming free radicals with high reactivity. The free radicals react with a reactive gas in the air when they are exposed to the air, thereby forming a hydrophilic group on the surface of the film. Upon injection of the reactive gas, the free radicals easily react with the reactive gas, thereby being more effective in forming the hydrophilic group. (For example, if the reactive gas is oxygen, carboxyl (-COOH) is formed.) As a result of such reaction, the microporous film according to the present invention has an improved hydrophilicity, which results in outstanding electrolyte wettability.

The microporous film disclosed in Hasegawa et al. is characterized by its crosslinked structure (claim 1) - providing a microporous film having a crosslinked structure by applying a crosslinking treatment to a specific polyethylene microporous film or the intermediate product thereof. This film has a sharp fuse effect and high heat resistance (column 2, lines 60-65 and column 3, lines 29-46. As a example of the method used for crosslinking, Hasegawa et al. disclose ionizing radiation, a method preferably performed in the presence of an inert gas in

order to maintain the oxygen concentration at as low a level as possible (column 7, line 19 to column 8, line 35).

The Hasegawa et al. film is characterized by the structure of crosslinking polymers to each other within the film, while the film of the presently claimed invention has the structure of forming hydrophilic groups on the surface of the film through the reaction of air or a reactive gas with radicals formed from the polymers on the surface of the film.

The crosslinked structure of the Hasegawa et al. is formed over the whole thickness of the film, while the hydrophilic groups formed in the film of the claims invention is present only on the surface of the film.

Although both inventions disclose ionizing radiation, they are distinguished from each other by treatment conditions and functions. In Hasegawa et al., ionizing radiation is fully performed as to form a crosslinked structure over the whole thickness of the film. In the claimed invention, ionizing radiation is performed to the extent that the radical is formed only on the surface of the film. The conditions for such irradiation may be selected by one skilled in the art. As shown in the subject application, and Hasegawa et al, each of the inventions discloses different conditions for irradiation. More specifically, claim 1 of the present invention clearly discloses, "treating the surface of film by irradiation with ionizing radiation". The amount of irradiation disclosed in Hasegawa et al. (5 Mrad - 200 Mrad - column 7, lines 27-38) and that disclosed in the examples included in the specification of the present application (2 keV, 10^{12} ions/cm^2 or 0.3 ke V, $10^{15} \sim 10^{18}$ ions/cm^2) differs greatly from each other. Since each of the inventions performs irradiation of ionizing radiation under different conditions, films of different structures are formed as described above.

Other differences include the following: Hasegawa et al. performs ionizing radiation preferably in the presence of an inert gas, while the claims invention performs ionizing radiation preferably in the presence of reactive gas, such as oxygen; the film of Hasegawa et al. obtains a sharp fuse effect and high heat resistance from the structural characteristic above, while the film of the claimed invention has improved electrolyte wettability.

For the reasons discussed above, Applicant contends that claim 1 is neither anticipated by nor rendered obvious over Hasegawa et al.

The microporous material as disclosed in Exsted et al. comprises a polymer and an oil component including at least one crosslinked oil. Exsted et al. disclose a method of crosslinking radicals or ions from a crosslinkable oil with the oil itself and/or a polymer by use of a radiation energy source that generates the radicals or ion from the crosslinkable oil. Through such a method, the crosslinked oil included in the microporous material is able to render the microporous material hydrophilic or wettable with water (column 8, lines 11-63 and column 10, lines 35-49).

The Exsted et al. invention and the present invention are different from each other in that: (i) the microporous material of Exsted et al. is hydrophilic as a result of utilizing the crosslinked oil, while the microporous film of the claimed invention is hydrophilic as a result of forming a hydrophilic group on its surface, instead of utilizing the crosslinked oil; and (ii) the radiation energy source as disclosed in Exsted et al. does not directly affect the surface of the microporous material, and generates radicals or ions from the crosslinkable oil, while the ionizing radiation as disclosed in the claimed invention directly affects the surface of the film and forms hydrophilic radicals. Accordingly, each of the inventions is different from the other.

In view of the foregoing, Applicant does not believe it is necessary to address the remaining rejections of the dependent claims under 103(a), since the primary references relied upon do not anticipate or render obvious the subject matter claimed in independent claim 1.

Reconsideration of the pending claims is respectfully requested.

Respectfully submitted,

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Enclosures